Is bigger really better?
Assessing caloric value of lepidopterans as bat prey

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Introduction

- Bats are principal predators of nocturnal insects
- Lepidoptera are a core resource for most North American bats
- Differences in energetic profitability among lepidopteran species may influence prey selection
- Notably, some bat species remove the wings of Lepidoptera prior to consumption, potentially to maximize energetic profitability

Rafinesque's Big-Eared Bat will capture moths, then remove their wings before feeding

Objectives

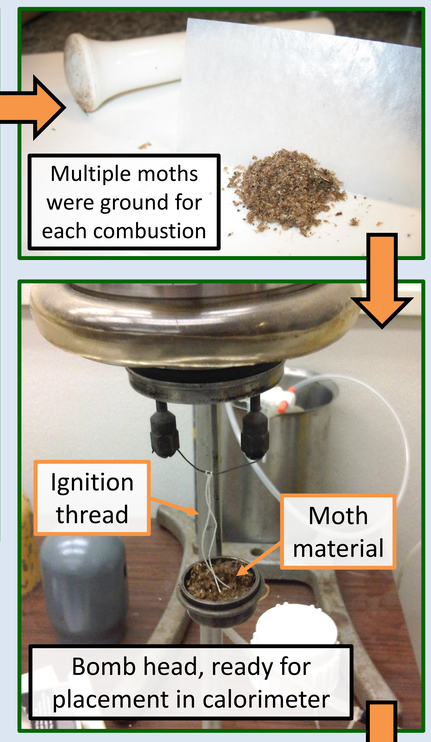
In order to develop a standardized method for assessing the nutritive content of insects, we assessed the caloric content of readily-reared Lepidoptera, the eastern tent caterpillar (*Malacosoma americanum*) and cabbage looper (*Trichoplusia ni*)

Field collected *M. americanum* feeding in the lab

Rearing Methods

- Tents of *M. americanum* were field-collected as late instar larvae and fed wild cherry foliage until pupation
- Lab-bred *T. ni* were reared on artificial diet until pupation
- Emergent moths were immediately frozen using liquid nitrogen
- Moths were subsequently dried (55°C, 24 hours) for combustion

M. americanum adult



Calorimetry Methods

- Finely ground moth samples (ca. 250 mg) were combusted in a bomb calorimeter to determine the gross heat generated (calories / gram)
- Caloric yield of *M. americanum* was measured regardless of size with wings intact (n = 5 reactions)
- *T. ni* were allotted to a 2×2 treatment structure (n = 24 total reactions)

Masses of Moths

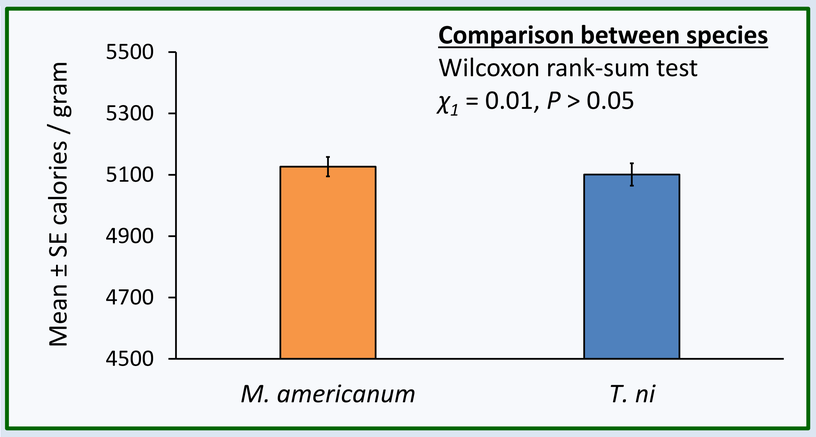
Sample group	Mean ± SE
M. americanum	241 ± 3 mg
Large *T. ni*	118 ± 1 mg
Small *T. ni*	87 ± 1 mg

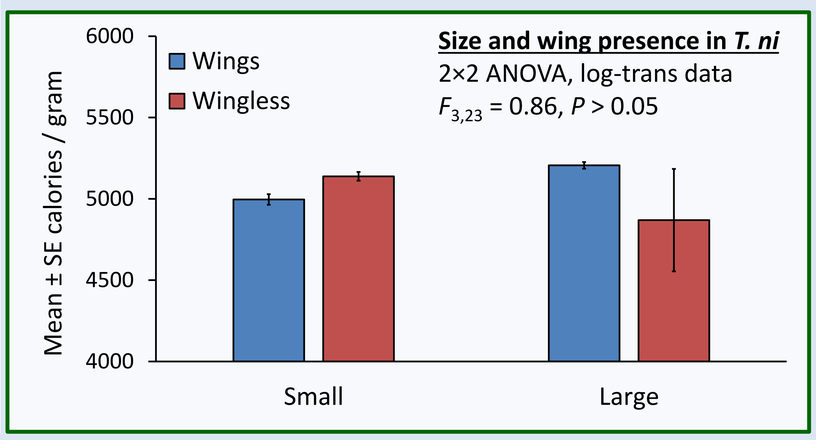
Study Design for *T. ni*

Size class	Wings
Large	Present
Large	Removed
Small	Present
Small	Removed

Results and Discussion

- Caloric yield of *M. americanum* vs. *T. ni*
  - No differences detected
  - Results indicate consistency in the calorimetry procedure
- Effects of size and wing presence on the caloric value of *T. ni*
  - No differences between size classes
  - No differences relating to wing presence
  - Results indicate that wing removal by bats may not afford a direct caloric benefit or detriment, suggesting that wing removal may be motivated by palatability or by a more complex behavioral motivation





Implications and Future Work

- Development of this method now allows for an expanded field assessment across a breadth of moth taxa
- Collections are ongoing at Mammoth Cave National Park

Acknowledgements

- Many thanks to Rick Toomey at NPS and Abe Nielsen at UK
- JFSP, USDA-FS, EKU BIOS, UK CAFE